

Work Order ID 95226

95226

Page 1

January 02-13 1:08:21 PM

Item ID: D6015-125

Accept

N900040100

Setup Start *NS1*

Revision ID:

Stop *NS2*

Item Name: Crosstube Material

Start Date: 1/02/13

Start Qty: 80

R0

Cust Item ID:

Required Date: 2/08/13

Req'd Qty: 60.00

R0

Customer:

Reference:

Approvals:

Process Plan:

Date:

Tooling:

Date:

Run Start *NR1*

QC:

Date:

SPC (Y/N):

Date:

Stop *NR2*

| Sequence ID/ Work Center ID | Operation Description | Set Up/ Run Hours | Tool ID | Tool # | Plan Code | Accept Qty | Reject Qty | Reject Number | Insp. Stamp |
|--------------------------------|--------------------------|----------------------|---------|--------|--------------|---------------|---------------|------------------|----------------|
|--------------------------------|--------------------------|----------------------|---------|--------|--------------|---------------|---------------|------------------|----------------|

Draw Nbr

Revision Nbr

D6015

Rev B

100

0.00

100

PURCHASING

Purchasing

Memo

0.00

Purchasing

Issue P/O

A) Extrude and manufacture as per Dwg D6015
B) Material: AISI 4130 (AMS 6371) seamless steel tube
C) Material certification

Factory Steel

110

Receive & Inspect for Damage & Mat'l Certs

0.00

110

Packaging

Memo

0.00

Packaging

Ensure material certification is attached

120

QC6- Inspect dimensions to drawing

0.00

120

QC

Memo

0.00

Quality Control

Ensure Material certification comply to Dwg D6015

1/13-01-2

1/13/12 (80)

DAS 16 13/2/12

NCR: Yes / No

WORK ORDER NON-CONFORMANCE / UPDATE

DQA: _____ Date: _____

QA Closed: _____ Date: _____

| | | | | | | | | | | | | | | | | | | |
|--|---|---|--------------------------------------|------------------------------------|------------------------------------|--------------------------------------|------------------------------------|------------------------------------|--|----------------------------------|--|------------------------------------|--|--------------------------------|------------------------------------|------------------------------------|-----------------------------------|--|
| Work Order: _____ Part No. _____ NCR No. _____ | DISPOSITION Rework <input type="checkbox"/> Scrap <input type="checkbox"/> Use-as-is <input type="checkbox"/> Work Order Update <input type="checkbox"/> | AGAINST DEPARTMENT/PROCESS <table style="width: 100%;"> <tr> <td>Skid-tube <input type="checkbox"/></td> <td>Crosstube <input type="checkbox"/></td> <td>Water Jet <input type="checkbox"/></td> <td>Engineering <input type="checkbox"/></td> </tr> <tr> <td>Machining <input type="checkbox"/></td> <td>Small Fab <input type="checkbox"/></td> <td>Prod. Eng. Coord. <input type="checkbox"/></td> <td>Quality <input type="checkbox"/></td> </tr> <tr> <td>Thermoforming <input type="checkbox"/></td> <td>Finishing <input type="checkbox"/></td> <td>Rec/Store/Packaging <input type="checkbox"/></td> <td>Other <input type="checkbox"/></td> </tr> <tr> <td>Large Fab <input type="checkbox"/></td> <td>Composite <input type="checkbox"/></td> <td>Supplier <input type="checkbox"/></td> <td></td> </tr> </table> | Skid-tube <input type="checkbox"/> | Crosstube <input type="checkbox"/> | Water Jet <input type="checkbox"/> | Engineering <input type="checkbox"/> | Machining <input type="checkbox"/> | Small Fab <input type="checkbox"/> | Prod. Eng. Coord. <input type="checkbox"/> | Quality <input type="checkbox"/> | Thermoforming <input type="checkbox"/> | Finishing <input type="checkbox"/> | Rec/Store/Packaging <input type="checkbox"/> | Other <input type="checkbox"/> | Large Fab <input type="checkbox"/> | Composite <input type="checkbox"/> | Supplier <input type="checkbox"/> | |
| Skid-tube <input type="checkbox"/> | Crosstube <input type="checkbox"/> | Water Jet <input type="checkbox"/> | Engineering <input type="checkbox"/> | | | | | | | | | | | | | | | |
| Machining <input type="checkbox"/> | Small Fab <input type="checkbox"/> | Prod. Eng. Coord. <input type="checkbox"/> | Quality <input type="checkbox"/> | | | | | | | | | | | | | | | |
| Thermoforming <input type="checkbox"/> | Finishing <input type="checkbox"/> | Rec/Store/Packaging <input type="checkbox"/> | Other <input type="checkbox"/> | | | | | | | | | | | | | | | |
| Large Fab <input type="checkbox"/> | Composite <input type="checkbox"/> | Supplier <input type="checkbox"/> | | | | | | | | | | | | | | | | |

| Root Cause | Date | Step | Qty | Description of work order update or Non-conformance | Initial Chief Eng | Action Description | Sign & Date | Verification | QC Inspector |
|--|------|------|-----|---|-------------------|--------------------|-------------|--------------|--------------|
| Doc/Data <input type="checkbox"/> | | | | | | | | | |
| Equip/Tooling <input type="checkbox"/> | | | | | | | | | |
| Operator <input type="checkbox"/> | | | | | | | | | |
| Material <input type="checkbox"/> | | | | | | | | | |
| Setup <input type="checkbox"/> | | | | | | | | | |
| Other <input type="checkbox"/> | | | | | | | | | |
| Process <input type="checkbox"/> | | | | | | | | | |
| Supplier <input type="checkbox"/> | | | | | | | | | |
| Training <input type="checkbox"/> | | | | | | | | | |
| Unapproved <input type="checkbox"/> | | | | | | | | | |

FAULT CATEGORY

| | | |
|--|---|--|
| Landing Gear <input type="checkbox"/> Bending <input type="checkbox"/> Centre Not Concentric to O/S <input type="checkbox"/> Cracks <input type="checkbox"/> Crushed/Crimped. <input type="checkbox"/> Cuffs <input type="checkbox"/> Heat Treat <input type="checkbox"/> Inspection Strip in Tube <input type="checkbox"/> Ripples in Bend <input type="checkbox"/> Torque Waves in Extrusion <input type="checkbox"/> Turning Sequence <input type="checkbox"/> Wave/Twist in Tube | General <input type="checkbox"/> Bend <input type="checkbox"/> BOM/Route <input type="checkbox"/> Broken/Damaged <input type="checkbox"/> Burrs <input type="checkbox"/> Contamination <input type="checkbox"/> Countersink <input type="checkbox"/> Cut Too Short <input type="checkbox"/> Drill Holes <input type="checkbox"/> Drawing <input type="checkbox"/> Finish <input type="checkbox"/> Folio | <input type="checkbox"/> Grain <input type="checkbox"/> Hardware <input type="checkbox"/> Inspection Incomplete <input type="checkbox"/> Instructions Incomplete/Unclear <input type="checkbox"/> Maintenance <input type="checkbox"/> Mislabeled <input type="checkbox"/> Misread <input type="checkbox"/> Offset <input type="checkbox"/> Out of Calibration <input type="checkbox"/> Out of Sequence <input type="checkbox"/> Outside Dimensions <input type="checkbox"/> Ovalized <input type="checkbox"/> Over/Under tolerance <input type="checkbox"/> Part Incorrect <input type="checkbox"/> Part Lost/Missing <input type="checkbox"/> Part Moved <input type="checkbox"/> Positioned Wrong <input type="checkbox"/> Power Loss/Surge <input type="checkbox"/> Pressure/Forced <input type="checkbox"/> Temperature/Cure <input type="checkbox"/> Weld <input type="checkbox"/> Wrong Stock Pulled <input type="checkbox"/> Other |
|--|---|--|

Work Order ID 95226

95226

Page 2

January-02-13 1:08:21 PM

Item ID: D6015-125 Accept ***N900040100*** Setup Start ***NS1***
 Revision ID: Stop ***NS2***
 Item Name: Crosstube Material
 Start Date: 1/02/13 Start Qty: 60.00 ***60*** Cust Item ID:
 Required Date: 2/08/13 Req'd Qty: 60.00 ***60*** Customer:
 Reference:

Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____ Run Start ***NR1***
 QC: _____ Date: _____ SPC (Y/N): _____ Date: _____ Stop ***NR2***

| Sequence ID/ Work Center ID | Operation Description | Set Up/ Run Hours | Tool ID | Tool # | Plan Code | Accept Qty | Reject Qty | Reject Number | Insp. Stamp |
|--------------------------------|---|----------------------|---------|--------|--------------|---------------|---------------|------------------|-----------------|
| 130 | Identify as per dwg & Stock Location <i>L/C</i> | 0.00 | | | | <i>80</i> | <i>6</i> | | |
| *130* | | | | | | | | | |
| Packaging | Memo | 0.00 | | | | | | | |
| Packaging | | | | | | | | | <i>9mm</i> |
| | | | | | | | | | <i>13/02/17</i> |
| 140 | QC21- Final Inspection - Work Order Release | 0.00 | | | | | | | |
| *140* | | | | | | | | | |
| QC | Memo | 0.00 | | | | | | | <i>13/2/19</i> |
| Quality Control | | | | | | | | | |

11/13/02-15

NCR: Yes / No

WORK ORDER NON-CONFORMANCE / UPDATE

DQA: _____ Date: _____

QA Closed: _____ Date: _____

| | | | | | | | | | | | |
|---|------|------|---|---|----------------------|---|----------------|--------------|---|--|--|
| Work Order: _____ Part No. _____ NCR No. _____ | | | | DISPOSITION Rework <input type="checkbox"/> Scrap <input type="checkbox"/> Use-as-is <input type="checkbox"/> Work Order Update <input type="checkbox"/> | | AGAINST DEPARTMENT/PROCESS <div style="display: flex; justify-content: space-between;"> <div> Skid-tube <input type="checkbox"/> Machining <input type="checkbox"/> Thermoforming <input type="checkbox"/> Large Fab <input type="checkbox"/> </div> <div> Crosstube <input type="checkbox"/> Small Fab <input type="checkbox"/> Finishing <input type="checkbox"/> Composite <input type="checkbox"/> </div> <div> Water Jet <input type="checkbox"/> Prod. Eng. Coord. <input type="checkbox"/> Rec/Store/Packaging <input type="checkbox"/> Supplier <input type="checkbox"/> </div> <div> Engineering <input type="checkbox"/> Quality <input type="checkbox"/> Other <input type="checkbox"/> </div> </div> | | | | | |
| Root Cause | Date | Step | Qty | Description of work order update or Non-conformance | Initial Chief Eng | Action Description | Sign & Date | Verification | QC Inspector | | |
| Doc/Data <input type="checkbox"/> | | | | | | | | | | | |
| Equip/Tooling <input type="checkbox"/> | | | | | | | | | | | |
| Operator <input type="checkbox"/> | | | | | | | | | | | |
| Material <input type="checkbox"/> | | | | | | | | | | | |
| Setup <input type="checkbox"/> | | | | | | | | | | | |
| Other <input type="checkbox"/> | | | | | | | | | | | |
| Process <input type="checkbox"/> | | | | | | | | | | | |
| Supplier <input type="checkbox"/> | | | | | | | | | | | |
| Training <input type="checkbox"/> | | | | | | | | | | | |
| Unapproved <input type="checkbox"/> | | | | | | | | | | | |
| FAULT CATEGORY | | | | | | | | | | | |
| Landing Gear <input type="checkbox"/> Bending <input type="checkbox"/> Centre Not Concentric to O/S <input type="checkbox"/> Cracks <input type="checkbox"/> Crushed/Crimped <input type="checkbox"/> Cuffs <input type="checkbox"/> Heat Treat <input type="checkbox"/> Inspection Strip in Tube <input type="checkbox"/> Ripples in Bend <input type="checkbox"/> Torque Waves in Extrusion <input type="checkbox"/> Turning Sequence <input type="checkbox"/> Wave/Twist in Tube | | | General <input type="checkbox"/> Bend <input type="checkbox"/> BOM/Route <input type="checkbox"/> Broken/Damaged <input type="checkbox"/> Burrs <input type="checkbox"/> Contamination <input type="checkbox"/> Countersink <input type="checkbox"/> Cut Too Short <input type="checkbox"/> Drill Holes <input type="checkbox"/> Drawing <input type="checkbox"/> Finish <input type="checkbox"/> Folio | | | <input type="checkbox"/> Grain <input type="checkbox"/> Hardware <input type="checkbox"/> Inspection Incomplete <input type="checkbox"/> Instructions Incomplete/Unclear <input type="checkbox"/> Maintenance <input type="checkbox"/> Mislabeled <input type="checkbox"/> Misread <input type="checkbox"/> Offset <input type="checkbox"/> Out of Calibration <input type="checkbox"/> Out of Sequence <input type="checkbox"/> Outside Dimensions | | | <input type="checkbox"/> Ovalized <input type="checkbox"/> Over/Under tolerance <input type="checkbox"/> Part Incorrect <input type="checkbox"/> Part Lost/Missing <input type="checkbox"/> Part Moved <input type="checkbox"/> Positioned Wrong <input type="checkbox"/> Power Loss/Surge <input type="checkbox"/> Pressure/Forced <input type="checkbox"/> Temperature/Cure <input type="checkbox"/> Weld <input type="checkbox"/> Wrong Stock Pulled <input type="checkbox"/> Other | | |

Picklist Print

January-02-13 1:08:21 PM

Page 1

Work Order ID: 95226

Parent Item: D6015-125

Parent Item Name: Crosstube Material

Start Date: 1/02/13

Required Date: 2/08/13

Start Qty: 60.00 *80*

Required Qty: 60.00

Comments: IPP Rev:A 11.02.18 new issue DD verf:EC

| Component Item ID/ Item Name | Replacement Item ID | Mfg/ Purch | Bin Item | Primary Location | Last Location | Route Seq ID | Unit of Measure | Qty on Hand | Qty per Kit | Total Qty | Qty Issued | Date Issued | Status |
|----------------------------------|------------------------|---------------|-------------|---------------------|------------------|-----------------|--------------------|----------------|-------------|---------------|---------------|----------------|--------|
| D6015-125P Crosstube Material | | Purchased | No | | | 110 | Each | 0.0000 | 1 | 60 | | | |

1/43/4/12 (80)

NCR: Yes / No

WORK ORDER NON-CONFORMANCE / UPDATE

DQA: _____ Date: _____

QA Closed: _____ Date: _____

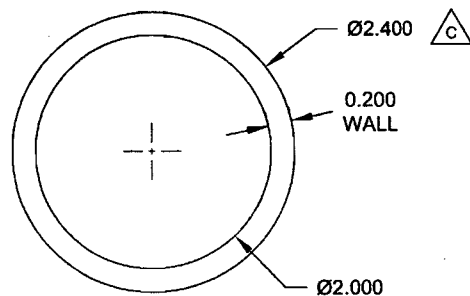
| | | | | | | | | | | | | | | | | | | |
|--|---|---|--------------------------------------|------------------------------------|------------------------------------|--------------------------------------|------------------------------------|------------------------------------|--|----------------------------------|--|------------------------------------|--|--------------------------------|------------------------------------|------------------------------------|-----------------------------------|--|
| Work Order: _____ Part No. _____ NCR No. _____ | DISPOSITION Rework <input type="checkbox"/> Scrap <input type="checkbox"/> Use-as-is <input type="checkbox"/> Work Order Update <input type="checkbox"/> | AGAINST DEPARTMENT/PROCESS <table style="width: 100%;"> <tr> <td>Skid-tube <input type="checkbox"/></td> <td>Crosstube <input type="checkbox"/></td> <td>Water Jet <input type="checkbox"/></td> <td>Engineering <input type="checkbox"/></td> </tr> <tr> <td>Machining <input type="checkbox"/></td> <td>Small Fab <input type="checkbox"/></td> <td>Prod. Eng. Coord. <input type="checkbox"/></td> <td>Quality <input type="checkbox"/></td> </tr> <tr> <td>Thermoforming <input type="checkbox"/></td> <td>Finishing <input type="checkbox"/></td> <td>Rec/Store/Packaging <input type="checkbox"/></td> <td>Other <input type="checkbox"/></td> </tr> <tr> <td>Large Fab <input type="checkbox"/></td> <td>Composite <input type="checkbox"/></td> <td>Supplier <input type="checkbox"/></td> <td></td> </tr> </table> | Skid-tube <input type="checkbox"/> | Crosstube <input type="checkbox"/> | Water Jet <input type="checkbox"/> | Engineering <input type="checkbox"/> | Machining <input type="checkbox"/> | Small Fab <input type="checkbox"/> | Prod. Eng. Coord. <input type="checkbox"/> | Quality <input type="checkbox"/> | Thermoforming <input type="checkbox"/> | Finishing <input type="checkbox"/> | Rec/Store/Packaging <input type="checkbox"/> | Other <input type="checkbox"/> | Large Fab <input type="checkbox"/> | Composite <input type="checkbox"/> | Supplier <input type="checkbox"/> | |
| Skid-tube <input type="checkbox"/> | Crosstube <input type="checkbox"/> | Water Jet <input type="checkbox"/> | Engineering <input type="checkbox"/> | | | | | | | | | | | | | | | |
| Machining <input type="checkbox"/> | Small Fab <input type="checkbox"/> | Prod. Eng. Coord. <input type="checkbox"/> | Quality <input type="checkbox"/> | | | | | | | | | | | | | | | |
| Thermoforming <input type="checkbox"/> | Finishing <input type="checkbox"/> | Rec/Store/Packaging <input type="checkbox"/> | Other <input type="checkbox"/> | | | | | | | | | | | | | | | |
| Large Fab <input type="checkbox"/> | Composite <input type="checkbox"/> | Supplier <input type="checkbox"/> | | | | | | | | | | | | | | | | |

| Root Cause | Date | Step | Qty | Description of work order update or Non-conformance | Initial Chief Eng | Action Description | Sign & Date | Verification | QC Inspector |
|--|------|------|-----|---|-------------------|--------------------|-------------|--------------|--------------|
| Doc/Data <input type="checkbox"/> | | | | | | | | | |
| Equip/Tooling <input type="checkbox"/> | | | | | | | | | |
| Operator <input type="checkbox"/> | | | | | | | | | |
| Material <input type="checkbox"/> | | | | | | | | | |
| Setup <input type="checkbox"/> | | | | | | | | | |
| Other <input type="checkbox"/> | | | | | | | | | |
| Process <input type="checkbox"/> | | | | | | | | | |
| Supplier <input type="checkbox"/> | | | | | | | | | |
| Training <input type="checkbox"/> | | | | | | | | | |
| Unapproved <input type="checkbox"/> | | | | | | | | | |

FAULT CATEGORY

| | | |
|---|---|---|
| Landing Gear <input type="checkbox"/> Bending <input type="checkbox"/> Centre Not Concentric to O/S <input type="checkbox"/> Cracks <input type="checkbox"/> Crushed/Crimped <input type="checkbox"/> Cuffs <input type="checkbox"/> Heat Treat <input type="checkbox"/> Inspection Strip in Tube <input type="checkbox"/> Ripples in Bend <input type="checkbox"/> Torque Waves in Extrusion <input type="checkbox"/> Turning Sequence <input type="checkbox"/> Wave/Twist in Tube | General <input type="checkbox"/> Bend <input type="checkbox"/> BOM/Route <input type="checkbox"/> Broken/Damaged <input type="checkbox"/> Burrs <input type="checkbox"/> Contamination <input type="checkbox"/> Countersink <input type="checkbox"/> Cut Too Short <input type="checkbox"/> Drill Holes <input type="checkbox"/> Drawing <input type="checkbox"/> Finish <input type="checkbox"/> Folio | <input type="checkbox"/> Grain <input type="checkbox"/> Hardware <input type="checkbox"/> Inspection Incomplete <input type="checkbox"/> Instructions Incomplete/Unclear <input type="checkbox"/> Maintenance <input type="checkbox"/> Mislabeled <input type="checkbox"/> Misread <input type="checkbox"/> Offset <input type="checkbox"/> Out of Calibration <input type="checkbox"/> Out of Sequence <input type="checkbox"/> Outside Dimensions |
| | | <input type="checkbox"/> Ovalized <input type="checkbox"/> Over/Under tolerance <input type="checkbox"/> Part Incorrect <input type="checkbox"/> Part Lost/Missing <input type="checkbox"/> Part Moved <input type="checkbox"/> Positioned Wrong <input type="checkbox"/> Power Loss/Surge |
| | | <input type="checkbox"/> Pressure/Forced <input type="checkbox"/> Temperature/Cure <input type="checkbox"/> Weld <input type="checkbox"/> Wrong Stock Pulled <input type="checkbox"/> Other |

SPECIFICATION CONTROL DRAWING



WLO 95226

NOTES

1) D6015-XXX CROSSTUBE
LENGTH

WHERE XXX IS LENGTH IN INCHES
EG. 125" LONG TUBE: D6015-125

2) MATERIAL: AISI 4130 (AMS 6371) SEAMLESS STEEL TUBE
2.400 OD x 2.000 ID
ANNEALED

3) TOLERANCES ARE PER ASTM A519 AS FOLLOWS:

O.D.: +0.007/-0.000

I.D.: +0.000/-0.007

LENGTH: XXX +0.188/-0.000

STRAIGHTNESS: 0.010" DEVIATION / 12" LENGTH

4) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE.

RELEASED
2011-01-18

| C | 2.400 WAS 2.500 (C5-1), ODxID WAS ODxWALL (A8-1) | CP | 10.11.23 |
|------------|--|----|----------|
| B | REMOVE "NORMALIZED" | CP | 06.06.30 |
| A | NEW ISSUE | CP | 06.04.18 |
| REV. | DESCRIPTION | BY | DATE |
| DESIGN | 97 | | |
| DRAWN | 97 | | |
| CHECKED | | | |
| MFG. APPR. | | | |
| APPROVED | | | |
| DE APPR. | | | |
| DATE | 10.11.23 | | |

| | |
|--|------------------------|
| DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA | |
| DRAWING NO. D6015 | REV. C SHEET 1 OF 1 |
| TITLE CROSSTUBE MATERIAL | SCALE NTS |
| COPYRIGHT © 2006 BY DART AEROSPACE LTD <small>THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD</small> | |

NCR: Yes / No

WORK ORDER NON-CONFORMANCE / UPDATE

DQA: _____ Date: _____

QA Closed: _____ Date: _____

| | | | | | | | | | | | | | | | | | | |
|--|---|---|--------------------------------------|------------------------------------|------------------------------------|--------------------------------------|------------------------------------|------------------------------------|--|----------------------------------|--|------------------------------------|--|--------------------------------|------------------------------------|------------------------------------|-----------------------------------|--|
| Work Order: _____ Part No. _____ NCR No. _____ | DISPOSITION Rework <input type="checkbox"/> Scrap <input type="checkbox"/> Use-as-is <input type="checkbox"/> Work Order Update <input type="checkbox"/> | AGAINST DEPARTMENT/PROCESS <table style="width: 100%;"> <tr> <td>Skid-tube <input type="checkbox"/></td> <td>Crosstube <input type="checkbox"/></td> <td>Water Jet <input type="checkbox"/></td> <td>Engineering <input type="checkbox"/></td> </tr> <tr> <td>Machining <input type="checkbox"/></td> <td>Small Fab <input type="checkbox"/></td> <td>Prod. Eng. Coord. <input type="checkbox"/></td> <td>Quality <input type="checkbox"/></td> </tr> <tr> <td>Thermoforming <input type="checkbox"/></td> <td>Finishing <input type="checkbox"/></td> <td>Rec/Store/Packaging <input type="checkbox"/></td> <td>Other <input type="checkbox"/></td> </tr> <tr> <td>Large Fab <input type="checkbox"/></td> <td>Composite <input type="checkbox"/></td> <td>Supplier <input type="checkbox"/></td> <td></td> </tr> </table> | Skid-tube <input type="checkbox"/> | Crosstube <input type="checkbox"/> | Water Jet <input type="checkbox"/> | Engineering <input type="checkbox"/> | Machining <input type="checkbox"/> | Small Fab <input type="checkbox"/> | Prod. Eng. Coord. <input type="checkbox"/> | Quality <input type="checkbox"/> | Thermoforming <input type="checkbox"/> | Finishing <input type="checkbox"/> | Rec/Store/Packaging <input type="checkbox"/> | Other <input type="checkbox"/> | Large Fab <input type="checkbox"/> | Composite <input type="checkbox"/> | Supplier <input type="checkbox"/> | |
| Skid-tube <input type="checkbox"/> | Crosstube <input type="checkbox"/> | Water Jet <input type="checkbox"/> | Engineering <input type="checkbox"/> | | | | | | | | | | | | | | | |
| Machining <input type="checkbox"/> | Small Fab <input type="checkbox"/> | Prod. Eng. Coord. <input type="checkbox"/> | Quality <input type="checkbox"/> | | | | | | | | | | | | | | | |
| Thermoforming <input type="checkbox"/> | Finishing <input type="checkbox"/> | Rec/Store/Packaging <input type="checkbox"/> | Other <input type="checkbox"/> | | | | | | | | | | | | | | | |
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| Root Cause | Date | Step | Qty | Description of work order update or Non-conformance | Initial Chief Eng | Action Description | Sign & Date | Verification | QC Inspector |
|--|------|------|-----|---|-------------------|--------------------|-------------|--------------|--------------|
| Doc/Data <input type="checkbox"/> | | | | | | | | | |
| Equip/Tooling <input type="checkbox"/> | | | | | | | | | |
| Operator <input type="checkbox"/> | | | | | | | | | |
| Material <input type="checkbox"/> | | | | | | | | | |
| Setup <input type="checkbox"/> | | | | | | | | | |
| Other <input type="checkbox"/> | | | | | | | | | |
| Process <input type="checkbox"/> | | | | | | | | | |
| Supplier <input type="checkbox"/> | | | | | | | | | |
| Training <input type="checkbox"/> | | | | | | | | | |
| Unapproved <input type="checkbox"/> | | | | | | | | | |

FAULT CATEGORY

| Landing Gear | General | Other |
|---|---|--|
| <input type="checkbox"/> Bending | <input type="checkbox"/> Bend | <input type="checkbox"/> Grain |
| <input type="checkbox"/> Centre Not Concentric to O/S | <input type="checkbox"/> BOM/Route | <input type="checkbox"/> Hardware |
| <input type="checkbox"/> Cracks | <input type="checkbox"/> Broken/Damaged | <input type="checkbox"/> Inspection Incomplete |
| <input type="checkbox"/> Crushed/Crimped | <input type="checkbox"/> Burrs | <input type="checkbox"/> Instructions Incomplete/Unclear |
| <input type="checkbox"/> Cuffs | <input type="checkbox"/> Contamination | <input type="checkbox"/> Maintenance |
| <input type="checkbox"/> Heat Treat | <input type="checkbox"/> Countersink | <input type="checkbox"/> Mislabeled |
| <input type="checkbox"/> Inspection Strip in Tube | <input type="checkbox"/> Cut Too Short | <input type="checkbox"/> Misread |
| <input type="checkbox"/> Ripples in Bend | <input type="checkbox"/> Drill Holes | <input type="checkbox"/> Offset |
| <input type="checkbox"/> Torque Waves in Extrusion | <input type="checkbox"/> Drawing | <input type="checkbox"/> Out of Calibration |
| <input type="checkbox"/> Turning Sequence | <input type="checkbox"/> Finish | <input type="checkbox"/> Out of Sequence |
| <input type="checkbox"/> Wave/Twist in Tube | <input type="checkbox"/> Folio | <input type="checkbox"/> Outside Dimensions |
| | | <input type="checkbox"/> Ovalized |
| | | <input type="checkbox"/> Over/Under tolerance |
| | | <input type="checkbox"/> Part Incorrect |
| | | <input type="checkbox"/> Part Lost/Missing |
| | | <input type="checkbox"/> Part Moved |
| | | <input type="checkbox"/> Positioned Wrong |
| | | <input type="checkbox"/> Power Loss/Surge |
| | | <input type="checkbox"/> Pressure/Forced |
| | | <input type="checkbox"/> Temperature/Cure |
| | | <input type="checkbox"/> Weld |
| | | <input type="checkbox"/> Wrong Stock Pulled |
| | | <input type="checkbox"/> Other |



Dart Aerospace Ltd.
1270 Aberdeen Street
Hawkesbury, ON K6A 1K7
Tel: 613 632 9577
Fax: 613 632 1053

PURCHASE ORDER

Purchase Order ID **PO18682**

Purchase Order Date 1/2/2013

PO Print Date 1/2/2013

Page Number 1 of 1

Order From :

VU-FAC001

FACTORY STEEL
14020 OAKLAND AVE.
DETROIT,, MI 48203
US

Contact Name

Buyer

Brigitte Golden

Vendor Phone

313 883 6300

Requisition Nbr

Vendor Fax

313 883 4883

Tax Resale Nbr

10127-2607

Vendor Account Nbr

Terms

Net 30

Currency

USD

FOB

Destination-Collect

Ship To :

DART AEROSPACE LTD 1270 ABERDEEN
HAWKESBURY, ON K6A 1K7
CANADA

| Line Nbr | Reference Revision ID Vendor Part Number | Description/ Mfg ID | Req Date/ Taxable | Req Qty/ Unit of Measure | Ship Method | Unit Price | Extended Price |
|----------|--|------------------------|----------------------|-----------------------------|-------------|------------|-------------------|
| 1 | D6015-125P | Crosstube Material | 2/8/2013 Yes | 80.00 Each | | \$180.0000 | \$14,400.00 |

Special Inst: As per DWG: D6015 Rev: B
B95226

PO Total:

\$14,400.00

Change Nbr:

1

Change Date: 1/2/2013

No substitution or deviation without
consent.
Certificate of Conformity or Material
Certification required - YES NO

PACKING LIST

No. 36257

PG 1 OF 1

PL

SO

| | | | | | | | |
|---|--|---|--|--|--|-------------------------|--|
| FACTORY STEEL & METAL SUPPLY 14020 OAKLAND AVENUE DETROIT, MI 48203 | | PURCHASE ORDER # P018682 | | BUYER BRIDGITTE GOLDEN | | SHIP DATE 02/07/2013 | |
| (313)883-6300 PHONE (313)883-4883 FAX | | JOB NAME | | Tel (613) 632-5200 Fax (613) 632-1185 | | SHIP VIA YRC | |
| SOLD TO DART AEROSPACE 1270 ABERDEEN STREET HAWKESBURY, ON K6A 1K7 | | SALES ORDER # 30586 | | ORDER DATE 01/07/2013 | | SALES REP MICK HALON | |
| | | SHIP TO DART AEROSPACE 1270 ABERDEEN STREET HAWKESBURY, ON K6A 1K7 | | SHIP INST YRC | | RESALE # 59-2958719 | |
| | | | | PRO# | | CARRIER YRC | |
| | | | | TERMS NET 30 DAYS | | BLIND Y/N N | |
| | | | | | | FOB DETROIT | |

| LINE | QUANTITY | DESCRIPTION | WIDTH | LENGTH | WEIGHT | UNIT PRICE | TOTAL |
|-------------------------|----------|---|-------|---------------|-----------|------------|-------|
| 1 | 80 PCS | RETURN SIGNED FOR PROMPT PROCESSING FAX #313-883-4883 X 4130N CD SMLSS RD TUBE 2.400" OD X .200W Our Tag # Mill Ref # Heat # 84940 57210 00A125023 Pcs Total Ft 80 833.333 | | 125.000" | 3,916.665 | | |
| 2 | 1 PC | WOOD SHIPPING CRATE MTRS (CIRCLE) FAX SHIPMENT INVOICE ALL DATE: _____ INITIAL: _____ | | | | | |
| TOTAL WT | | 3,916 LBS | | | | | |
| RECEIVED BY - SIGNATURE | | RECEIVED BY - P | | DATE RECEIVED | | TOTAL | |



TEST REPORT

SHIPMENT

4808

MICHIGAN SEAMLESS TUBE

SOUTH LYON, MICHIGAN 48178

001

| ORDER NUMBER | CUSTOMER ORDER NUMBER | DATE | OFC | COM | DIWI | NET SLS | GR SLS | ACCOUNT NUMBER | US | PAGE |
|--------------|-----------------------|----------|-----|-----|------|---------|--------|----------------|-----|------|
| 057210 | 2035 | 01/04/13 | 22 | 00 | 15 | 16 | 01 | 02598001FCO | 1ME | 1 |

FACTORY STEEL & METAL SUPPLY
14020 OAKLAND
DETROIT MI USA 48203

FACTORY STEEL & METAL SUPPLY
14020 OAKLAND AVENUE
DETROIT MI 48203

SN 2
TR 3
INV 3

ROUTING

OPEN TOP/FULLY TARPED/FOB SOUTH LYON MI

P90 TRUCK

| ANALYSIS | SHAPE | PRODUCT | FC | ANNEAL | REQUESTED |
|---------------|---------------|-------------------|----|----------|-----------|
| 4130 | ROUND | COLD DRAWN | | PER SPEC | 02/08/13 |
| SPECIFICATION | CMST | DESCRIPTION | | | PROMISE |
| SEAMLESS | AMS-6371/A519 | CD ALLOY AIRCRAFT | | | 02/08/13 |

SPECIAL INSTRUCTIONS
OIL-UFAR COMPLIANT. MARK & CERT TO A519-96, MILT-6736BN NOTE-2,
AMS-636CL, AMS-6371J, AMS-T-6736AN & 4130H. CERT TO AMS-2301J &
DECARB LEVELS TO AMS-6371.80M PSI MIN YIELD, AIM 90 PSI. PRODUCE
FROM 1-HEAT. KERF: +.188"/-0, AIM EXACT QTY. STR & SURF CRITICAL-
NO MARKS. NO CIRCUM GRIND MARKS. MARK TO INCL GR & SPECS. BOX MAT'L

| ITEM | QUANTITY | O.D. | I.D. | WALL | LENGTH | WT/FT | WEIGHT |
|------|----------|--------|--------|------|--------|-------|----------|
| | | 2.400 | 2.000 | | | 4.699 | 00 16:05 |
| | | +.0070 | +.0000 | | | | 3 |
| | | -.0000 | -.0070 | | | | |

ITM BALE --BALE--
NUM NUM PCS FTG HEAT NO. LENGTH
1 3 W 80 834 00A125023 CUT 10' 5.000"

ITM PART
STATUS NUMBER
COM

| HEAT NO. | C | Mn | P | S | Si | Ni | Cr | Mo | Cu | Al | REMARKS |
|-----------|------|------|------|------|------|------|-------|------|------|------|---------|
| 00A125023 | .310 | .510 | .007 | .022 | .240 | .080 | 1.010 | .170 | .190 | .029 | EF SDI |

| HEAT NO. | ULT. STR. PSI | YIELD, PSI | %ELONG 2" | HARDNESS | HYDRO TEST PSI | ULTRA SONIC % | EDDY CURRENT | EXPANSION |
|-----------|---------------|------------|--------------|-------------|----------------|---------------|--------------|--------------|
| 00A125023 | 101,561 | 85,226 | 18.7 | HBW 223-226 | | | OK | |
| | | | | | BEND | FLATTEN | FLARE | REV. FLATTEN |
| | | | | | | | | FLANGE |

RECORD OK GRAIN SIZE 8
FREQ 0.00 SEV 0.00
MACROS S1 R1 C2
J1 J2 J3 J4 J5 J6 J7 J8 J9 J10
S1 S1 49 46 42 37 36 34 32 31
MELTED & MANUFACTURED IN USA

We hereby certify that the reported data are correct according to Michigan Seamless Tube tests and those of its suppliers.

EXTRUSION INSPECTION SHEET

| | | | | | | | | ULTRA SONIC MEASURMENTS | | | | |
|------------------|--------------|-------------------------------|-------------------------------|------------|-----------------------------------|---------------------------------|---------------------|-------------------------|--------|--------|--------|--------|
| TUBE # | TOTAL LENGTH | SIDE A DIA two readings | SIDE B DIA two readings | INSIDE DIA | wall thickness measured w/vern | Strightness at 12" in middle | Rockwell Reading | LOCATION on tube | R1 | R2 | R3 | R4 |
| DWG | 125.00" | 2.400" | | 2.000" | 0.200" | 0.010" | N/A | Middle | N/A | | | |
| 1 | 125.00" | 2.403"/2.405" | 2.402"/2.403" | 1.993" | 0.203"/0.206" | 0.0035" | N/A | Middle | 0.208" | 0.197" | 0.199" | 0.211" |
| 2 | 125.00" | 2.401"/2.403" | 2.403"/2.405" | 1.993" | 0.201"/0.206" | 0.0015" | N/A | Middle | 0.202" | 0.201" | 0.205" | 0.208" |
| 3 | 125.00" | 2.403"/2.405" | 2.403"/2.406" | 1.993" | 0.199"/0.209" | 0.0035" | N/A | Middle | 0.197" | 0.206" | 0.212" | 0.203" |
| 4 | 125.00" | 2.401"/2.402" | 2.403"/2.407" | 1.993" | 0.198"/0.211" | 0.004" | N/A | Middle | 0.210" | 0.210" | 0.200" | 0.198" |
| 5 | 125.00" | 2.403"/2.406" | 2.401"/2.406" | 1.995" | 0.203"/0.206" | 0.0015" | N/A | Middle | 0.203" | 0.204" | 0.208" | 0.207" |
| 6 | 125.00" | 2.404"/2.408" | 2.403"/2.405" | 1.993" | 0.201"/0.212" | 0.0035" | N/A | Middle | 0.207" | 0.206" | 0.203" | 0.204" |
| 7 | 125.00" | 2.401"/2.403" | 2.401"/2.409" | 1.993" | 0.201"/0.208" | 0.001" | N/A | Middle | 0.203" | 0.202" | 0.207" | 0.208" |
| 8 | 125.00" | 2.401"/2.404" | 2.403"/2.407" | 1.992" | 0.202"/0.206" | 0.003" | N/A | Middle | 0.213" | 0.211" | 0.197" | 0.200" |
| 9 | 125.00" | 2.404"/2.403" | 2.403"/2.407" | 1.993" | 0.201"/0.208" | 0.0015" | N/A | Middle | 0.203" | 0.204" | 0.208" | 0.208" |
| 10 | 125.00" | 2.401"/2.408" | 2.404"/2.408" | 1.991" | 0.202"/0.210" | 0.001" | N/A | Middle | 0.208" | 0.201" | 0.203" | 0.207" |
| 11 | 125.00" | 2.402"/2.405" | 2.403"/2.405" | 1.994" | 0.203"/0.206" | 0.003" | N/A | Middle | 0.204" | 0.201" | 0.207" | 0.210" |
| 12 | 125.00" | 2.402"/2.403" | 2.403"/2.405" | 1.992" | 0.203"/0.205" | 0.001" | N/A | Middle | 0.205" | 0.204" | 0.206" | 0.207" |
| 13 | 125.00" | 2.401"/2.404" | 2.404"/2.405" | 1.994" | 0.201"/0.206" | 0.0025" | N/A | Middle | 0.208" | 0.206" | 0.201" | 0.203" |
| 14 | | | | | | | N/A | Middle | | | | |
| 15 | | | | | | | N/A | Middle | | | | |
| PART # D6015-125 | | P/O# 18682 | | | BATCH # 95226 | | | Notes: | | | | |

MEAN OUTSIDE DIAMETER PERMISSIBLE ± 0.006 side A

| Tube # | Actual A | Actual B | Mean | Nominal | Tolerance | min allowable dimension | max allowable dimension | Results for min allowable | Results for max allowable |
|--------|----------|----------|-------|---------|-----------|-------------------------|-------------------------|---------------------------|---------------------------|
| 1 | 2.403 | 2.405 | 2.404 | 2.400 | 0.006 | 2.394 | 2.406 | 0.010 | -0.002 |
| 2 | 2.401 | 2.403 | 2.402 | 2.400 | 0.006 | 2.394 | 2.406 | 0.008 | -0.004 |
| 3 | 2.403 | 2.405 | 2.404 | 2.400 | 0.006 | 2.394 | 2.406 | 0.010 | -0.002 |
| 4 | 2.401 | 2.402 | 2.402 | 2.400 | 0.006 | 2.394 | 2.406 | 0.007 | -0.004 |
| 5 | 2.403 | 2.406 | 2.405 | 2.400 | 0.006 | 2.394 | 2.406 | 0.011 | -0.001 |
| 6 | 2.404 | 2.408 | 2.406 | 2.400 | 0.006 | 2.394 | 2.406 | 0.012 | 0.000 |
| 7 | 2.401 | 2.403 | 2.402 | 2.400 | 0.006 | 2.394 | 2.406 | 0.008 | -0.004 |
| 8 | 2.401 | 2.404 | 2.403 | 2.400 | 0.006 | 2.394 | 2.406 | 0.008 | -0.003 |
| 9 | 2.404 | 2.403 | 2.404 | 2.400 | 0.006 | 2.394 | 2.406 | 0.010 | -0.002 |
| 10 | 2.401 | 2.408 | 2.405 | 2.400 | 0.006 | 2.394 | 2.406 | 0.010 | -0.002 |
| 11 | 2.402 | 2.405 | 2.404 | 2.400 | 0.006 | 2.394 | 2.406 | 0.010 | -0.002 |
| 12 | 2.402 | 2.405 | 2.404 | 2.400 | 0.006 | 2.394 | 2.406 | 0.010 | -0.002 |
| 13 | 2.401 | 2.405 | 2.403 | 2.400 | 0.006 | 2.394 | 2.406 | 0.009 | -0.003 |
| 14 | | | | | | | | | |
| 15 | | | | | | | | | |
| 16 | | | | | | | | | |

MEAN OUTSIDE DIAMETER PERMISSIBLE ± 0.006 side B

| Tube # | Actual A | Actual B | Mean | Nominal | Tolerance | min allowable dimension | max allowable dimension | Results for min allowable | Results for max allowable |
|--------|----------|----------|-------|---------|-----------|-------------------------|-------------------------|---------------------------|---------------------------|
| 1 | 2.402 | 2.403 | 2.403 | 2.400 | 0.006 | 2.394 | 2.406 | 0.008 | -0.003 |
| 2 | 2.403 | 2.405 | 2.404 | 2.400 | 0.006 | 2.394 | 2.406 | 0.010 | -0.002 |
| 3 | 2.403 | 2.406 | 2.405 | 2.400 | 0.006 | 2.394 | 2.406 | 0.011 | -0.001 |
| 4 | 2.403 | 2.407 | 2.405 | 2.400 | 0.006 | 2.394 | 2.406 | 0.011 | -0.001 |
| 5 | 2.401 | 2.406 | 2.404 | 2.400 | 0.006 | 2.394 | 2.406 | 0.010 | -0.002 |
| 6 | 2.403 | 2.405 | 2.404 | 2.400 | 0.006 | 2.394 | 2.406 | 0.010 | -0.002 |
| 7 | 2.401 | 2.409 | 2.405 | 2.400 | 0.006 | 2.394 | 2.406 | 0.011 | -0.001 |
| 8 | 2.403 | 2.407 | 2.405 | 2.400 | 0.006 | 2.394 | 2.406 | 0.011 | -0.001 |
| 9 | 2.403 | 2.407 | 2.405 | 2.400 | 0.006 | 2.394 | 2.406 | 0.011 | -0.001 |
| 10 | 2.404 | 2.408 | 2.406 | 2.400 | 0.006 | 2.394 | 2.406 | 0.012 | 0.000 |
| 11 | 2.403 | 2.405 | 2.404 | 2.400 | 0.006 | 2.394 | 2.406 | 0.010 | -0.002 |
| 12 | 2.403 | 2.405 | 2.404 | 2.400 | 0.006 | 2.394 | 2.406 | 0.010 | -0.002 |
| 13 | 2.404 | 2.405 | 2.405 | 2.400 | 0.006 | 2.394 | 2.406 | 0.010 | -0.002 |
| 14 | | | | | | | | | |
| 15 | | | | | | | | | |
| 16 | | | | | | | | | |

OUTSIDE DIA. Permissible (with Ovality) ± 0.012 side A

| Tube # | Actual A | Nominal | Tolerance | min allowable dimension | max allowable dimension | Results for min allowable | Results for max allowable |
|--------|----------|---------|-----------|-------------------------|-------------------------|---------------------------|---------------------------|
| 1 | 2.403 | 2.400 | 0.012 | 2.388 | 2.412 | 0.015 | -0.009 |
| 2 | 2.401 | 2.400 | 0.012 | 2.388 | 2.412 | 0.013 | -0.011 |
| 3 | 2.403 | 2.400 | 0.012 | 2.388 | 2.412 | 0.015 | -0.009 |
| 4 | 2.401 | 2.400 | 0.012 | 2.388 | 2.412 | 0.013 | -0.011 |
| 5 | 2.403 | 2.400 | 0.012 | 2.388 | 2.412 | 0.015 | -0.009 |
| 6 | 2.404 | 2.400 | 0.012 | 2.388 | 2.412 | 0.016 | -0.008 |
| 7 | 2.401 | 2.400 | 0.012 | 2.388 | 2.412 | 0.013 | -0.011 |
| 8 | 2.401 | 2.400 | 0.012 | 2.388 | 2.412 | 0.013 | -0.011 |
| 9 | 2.404 | 2.400 | 0.012 | 2.388 | 2.412 | 0.016 | -0.008 |
| 10 | 2.401 | 2.400 | 0.012 | 2.388 | 2.412 | 0.013 | -0.011 |
| 11 | 2.402 | 2.400 | 0.012 | 2.388 | 2.412 | 0.014 | -0.010 |
| 12 | 2.402 | 2.400 | 0.012 | 2.388 | 2.412 | 0.014 | -0.010 |
| 13 | 2.401 | 2.400 | 0.012 | 2.388 | 2.412 | 0.013 | -0.011 |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | | | | | | |

OUTSIDE DIA. Permissible (with Ovality) ± 0.012 side b

| Tube # | Actual A | Nominal | Tolerance | min allowable dimension | max allowable dimension | Results for min allowable | Results for max allowable |
|--------|----------|---------|-----------|-------------------------|-------------------------|---------------------------|---------------------------|
| 1 | 2.402 | 2.400 | 0.012 | 2.388 | 2.412 | 0.014 | -0.010 |
| 2 | 2.403 | 2.400 | 0.012 | 2.388 | 2.412 | 0.015 | -0.009 |
| 3 | 2.403 | 2.400 | 0.012 | 2.388 | 2.412 | 0.015 | -0.009 |
| 4 | 2.403 | 2.400 | 0.012 | 2.388 | 2.412 | 0.015 | -0.009 |
| 5 | 2.401 | 2.400 | 0.012 | 2.388 | 2.412 | 0.013 | -0.011 |
| 6 | 2.403 | 2.400 | 0.012 | 2.388 | 2.412 | 0.015 | -0.009 |
| 7 | 2.401 | 2.400 | 0.012 | 2.388 | 2.412 | 0.013 | -0.011 |
| 8 | 2.403 | 2.400 | 0.012 | 2.388 | 2.412 | 0.015 | -0.009 |
| 9 | 2.403 | 2.400 | 0.012 | 2.388 | 2.412 | 0.015 | -0.009 |
| 10 | 2.404 | 2.400 | 0.012 | 2.388 | 2.412 | 0.016 | -0.008 |
| 11 | 2.403 | 2.400 | 0.012 | 2.388 | 2.412 | 0.015 | -0.009 |
| 12 | 2.403 | 2.400 | 0.012 | 2.388 | 2.412 | 0.015 | -0.009 |
| 13 | 2.404 | 2.400 | 0.012 | 2.388 | 2.412 | 0.016 | -0.008 |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | | | | | | |

OUTSIDE DIA. Permissible (with Ovality) ± 0.012 side A

| Tube # | Actual B | Nominal | Tolerance | min allowable dimension | max allowable dimension | Results for min allowable | Results for max allowable |
|--------|----------|---------|-----------|-------------------------|-------------------------|---------------------------|---------------------------|
| 1 | 2.405 | 2.400 | 0.012 | 2.388 | 2.412 | 0.017 | -0.007 |
| 2 | 2.403 | 2.400 | 0.012 | 2.388 | 2.412 | 0.015 | -0.009 |
| 3 | 2.405 | 2.400 | 0.012 | 2.388 | 2.412 | 0.017 | -0.007 |
| 4 | 2.402 | 2.400 | 0.012 | 2.388 | 2.412 | 0.014 | -0.010 |
| 5 | 2.406 | 2.400 | 0.012 | 2.388 | 2.412 | 0.018 | -0.006 |
| 6 | 2.408 | 2.400 | 0.012 | 2.388 | 2.412 | 0.020 | -0.004 |
| 7 | 2.403 | 2.400 | 0.012 | 2.388 | 2.412 | 0.015 | -0.009 |
| 8 | 2.404 | 2.400 | 0.012 | 2.388 | 2.412 | 0.016 | -0.008 |
| 9 | 2.403 | 2.400 | 0.012 | 2.388 | 2.412 | 0.015 | -0.009 |
| 10 | 2.408 | 2.400 | 0.012 | 2.388 | 2.412 | 0.020 | -0.004 |
| 11 | 2.405 | 2.400 | 0.012 | 2.388 | 2.412 | 0.017 | -0.007 |
| 12 | 2.405 | 2.400 | 0.012 | 2.388 | 2.412 | 0.017 | -0.007 |
| 13 | 2.405 | 2.400 | 0.012 | 2.388 | 2.412 | 0.017 | -0.007 |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | | | | | | |

OUTSIDE DIA. Permissible (with Ovality) ± 0.012 side b

| Tube # | Actual B | Nominal | Tolerance | min allowable dimension | max allowable dimension | Results for min allowable | Results for max allowable |
|--------|----------|---------|-----------|-------------------------|-------------------------|---------------------------|---------------------------|
| 1 | 2.403 | 2.400 | 0.012 | 2.388 | 2.412 | 0.015 | -0.009 |
| 2 | 2.405 | 2.400 | 0.012 | 2.388 | 2.412 | 0.017 | -0.007 |
| 3 | 2.406 | 2.400 | 0.012 | 2.388 | 2.412 | 0.018 | -0.006 |
| 4 | 2.407 | 2.400 | 0.012 | 2.388 | 2.412 | 0.019 | -0.005 |
| 5 | 2.406 | 2.400 | 0.012 | 2.388 | 2.412 | 0.018 | -0.006 |
| 6 | 2.405 | 2.400 | 0.012 | 2.388 | 2.412 | 0.017 | -0.007 |
| 7 | 2.409 | 2.400 | 0.012 | 2.388 | 2.412 | 0.021 | -0.003 |
| 8 | 2.407 | 2.400 | 0.012 | 2.388 | 2.412 | 0.019 | -0.005 |
| 9 | 2.407 | 2.400 | 0.012 | 2.388 | 2.412 | 0.019 | -0.005 |
| 10 | 2.408 | 2.400 | 0.012 | 2.388 | 2.412 | 0.020 | -0.004 |
| 11 | 2.405 | 2.400 | 0.012 | 2.388 | 2.412 | 0.017 | -0.007 |
| 12 | 2.405 | 2.400 | 0.012 | 2.388 | 2.412 | 0.017 | -0.007 |
| 13 | 2.405 | 2.400 | 0.012 | 2.388 | 2.412 | 0.017 | -0.007 |
| 14 | | | | | | | |
| 15 | | | | | | | |
| 16 | | | | | | | |

end measurement with vern

| Mean OUTSIDE DIA. Permissible +- 0.015 | | | | | | | | | |
|--|----------|----------|---------|---------|-----------|--------|-------|---------|---------|
| Tube | Actual A | Actual B | Mean | Nominal | Tolerance | min | max | min | max |
| 1 | 0.203 | 0.206 | 0.205 | 0.200 | 0.015 | 0.185 | 0.215 | 0.0195 | -0.011 |
| 2 | 0.201 | 0.206 | 0.204 | 0.200 | 0.015 | 0.185 | 0.215 | 0.0185 | -0.012 |
| 3 | 0.199 | 0.209 | 0.204 | 0.200 | 0.015 | 0.185 | 0.215 | 0.019 | -0.011 |
| 4 | 0.198 | 0.211 | 0.205 | 0.200 | 0.015 | 0.185 | 0.215 | 0.0195 | -0.011 |
| 5 | 0.203 | 0.206 | 0.205 | 0.200 | 0.015 | 0.185 | 0.215 | 0.0195 | -0.011 |
| 6 | 0.201 | 0.212 | 0.207 | 0.200 | 0.015 | 0.185 | 0.215 | 0.0215 | -0.009 |
| 7 | 0.201 | 0.208 | 0.205 | 0.200 | 0.015 | 0.185 | 0.215 | 0.0195 | -0.011 |
| 8 | 0.202 | 0.206 | 0.204 | 0.200 | 0.015 | 0.185 | 0.215 | 0.019 | -0.011 |
| 9 | 0.201 | 0.208 | 0.205 | 0.200 | 0.015 | 0.185 | 0.215 | 0.0195 | -0.011 |
| 10 | 0.202 | 0.210 | 0.206 | 0.200 | 0.015 | 0.185 | 0.215 | 0.021 | -0.009 |
| 11 | 0.203 | 0.206 | 0.205 | 0.200 | 0.015 | 0.185 | 0.215 | 0.0195 | -0.011 |
| 12 | 0.203 | 0.205 | 0.204 | 0.200 | 0.015 | 0.185 | 0.215 | 0.019 | -0.011 |
| 13 | 0.201 | 0.206 | 0.204 | 0.200 | 0.015 | 0.185 | 0.215 | 0.0185 | -0.012 |
| 14 | | | #DIV/0! | | 0.015 | -0.015 | 0.015 | #DIV/0! | #DIV/0! |
| 15 | | | #DIV/0! | | 0.015 | -0.015 | 0.015 | #DIV/0! | #DIV/0! |

| OUTSIDE DIA. Permissible +- 0.038 | | | | | | | | |
|-----------------------------------|----------|----------|---------|-----------|--------|-------|-------|--------|
| Tube | Actual A | Actual B | Nominal | Tolerance | min | max | min | max |
| 1 | 0.203 | 0.206 | 0.200 | 0.038 | 0.162 | 0.238 | 0.041 | -0.032 |
| 2 | 0.201 | 0.206 | 0.200 | 0.038 | 0.162 | 0.238 | 0.039 | -0.032 |
| 3 | 0.199 | 0.209 | 0.200 | 0.038 | 0.162 | 0.238 | 0.037 | -0.029 |
| 4 | 0.198 | 0.211 | 0.200 | 0.038 | 0.162 | 0.238 | 0.036 | -0.027 |
| 5 | 0.203 | 0.206 | 0.200 | 0.038 | 0.162 | 0.238 | 0.041 | -0.032 |
| 6 | 0.201 | 0.212 | 0.200 | 0.038 | 0.162 | 0.238 | 0.039 | -0.026 |
| 7 | 0.201 | 0.208 | 0.200 | 0.038 | 0.162 | 0.238 | 0.039 | -0.030 |
| 8 | 0.202 | 0.206 | 0.200 | 0.038 | 0.162 | 0.238 | 0.040 | -0.032 |
| 9 | 0.201 | 0.208 | 0.200 | 0.038 | 0.162 | 0.238 | 0.039 | -0.030 |
| 10 | 0.202 | 0.210 | 0.200 | 0.038 | 0.162 | 0.238 | 0.040 | -0.028 |
| 11 | 0.203 | 0.206 | 0.200 | 0.038 | 0.162 | 0.238 | 0.041 | -0.032 |
| 12 | 0.203 | 0.205 | 0.200 | 0.038 | 0.162 | 0.238 | 0.041 | -0.033 |
| 13 | 0.201 | 0.206 | 0.200 | 0.038 | 0.162 | 0.238 | 0.039 | -0.032 |
| 14 | | | | 0.038 | -0.038 | 0.038 | 0.038 | -0.038 |
| 15 | | | | 0.038 | -0.038 | 0.038 | 0.038 | -0.038 |

center measurment with ultra sonic

| Mean OUTSIDE DIA. Permissible +- 0.015 | | | | | | | | | |
|--|---------|--------|---------|---------|-----------|--------|-------|---------|---------|
| Tube | highest | lowest | Mean | Nominal | Tolerance | min | max | min | max |
| 1 | 0.211 | 0.197 | 0.204 | 0.200 | 0.015 | 0.185 | 0.215 | 0.019 | -0.011 |
| 2 | 0.208 | 0.201 | 0.205 | 0.200 | 0.015 | 0.185 | 0.215 | 0.0195 | -0.011 |
| 3 | 0.212 | 0.197 | 0.205 | 0.200 | 0.015 | 0.185 | 0.215 | 0.0195 | -0.011 |
| 4 | 0.210 | 0.198 | 0.204 | 0.200 | 0.015 | 0.185 | 0.215 | 0.019 | -0.011 |
| 5 | 0.208 | 0.203 | 0.206 | 0.200 | 0.015 | 0.185 | 0.215 | 0.0205 | -0.010 |
| 6 | 0.207 | 0.203 | 0.205 | 0.200 | 0.015 | 0.185 | 0.215 | 0.02 | -0.010 |
| 7 | 0.208 | 0.202 | 0.205 | 0.200 | 0.015 | 0.185 | 0.215 | 0.02 | -0.010 |
| 8 | 0.213 | 0.197 | 0.205 | 0.200 | 0.015 | 0.185 | 0.215 | 0.02 | -0.010 |
| 9 | 0.208 | 0.203 | 0.206 | 0.200 | 0.015 | 0.185 | 0.215 | 0.0205 | -0.010 |
| 10 | 0.208 | 0.201 | 0.205 | 0.200 | 0.015 | 0.185 | 0.215 | 0.0195 | -0.011 |
| 11 | 0.210 | 0.201 | 0.206 | 0.200 | 0.015 | 0.185 | 0.215 | 0.0205 | -0.010 |
| 12 | 0.207 | 0.204 | 0.206 | 0.200 | 0.015 | 0.185 | 0.215 | 0.0205 | -0.010 |
| 13 | 0.208 | 0.201 | 0.205 | 0.200 | 0.015 | 0.185 | 0.215 | 0.0195 | -0.011 |
| 14 | | | #DIV/0! | | 0.015 | -0.015 | 0.015 | #DIV/0! | #DIV/0! |
| 15 | | | #DIV/0! | | 0.015 | -0.015 | 0.015 | #DIV/0! | #DIV/0! |

| OUTSIDE DIA. Permissible +- 0.038 | | | | | | | | |
|-----------------------------------|---------|--------|---------|-----------|--------|-------|-------|--------|
| Tube | highest | lowest | Nominal | Tolerance | min | max | min | max |
| 1 | 0.211 | 0.197 | 0.200 | 0.038 | 0.162 | 0.238 | 0.049 | -0.041 |
| 2 | 0.208 | 0.201 | 0.200 | 0.038 | 0.162 | 0.238 | 0.046 | -0.037 |
| 3 | 0.212 | 0.197 | 0.200 | 0.038 | 0.162 | 0.238 | 0.050 | -0.041 |
| 4 | 0.210 | 0.198 | 0.200 | 0.038 | 0.162 | 0.238 | 0.048 | -0.040 |
| 5 | 0.208 | 0.203 | 0.200 | 0.038 | 0.162 | 0.238 | 0.046 | -0.035 |
| 6 | 0.207 | 0.203 | 0.200 | 0.038 | 0.162 | 0.238 | 0.045 | -0.035 |
| 7 | 0.208 | 0.202 | 0.200 | 0.038 | 0.162 | 0.238 | 0.046 | -0.036 |
| 8 | 0.213 | 0.197 | 0.200 | 0.038 | 0.162 | 0.238 | 0.051 | -0.041 |
| 9 | 0.208 | 0.203 | 0.200 | 0.038 | 0.162 | 0.238 | 0.046 | -0.035 |
| 10 | 0.208 | 0.201 | 0.200 | 0.038 | 0.162 | 0.238 | 0.046 | -0.037 |
| 11 | 0.210 | 0.201 | 0.200 | 0.038 | 0.162 | 0.238 | 0.048 | -0.037 |
| 12 | 0.207 | 0.204 | 0.200 | 0.038 | 0.162 | 0.238 | 0.045 | -0.034 |
| 13 | 0.208 | 0.201 | 0.200 | 0.038 | 0.162 | 0.238 | 0.046 | -0.037 |
| 14 | | | | 0.038 | -0.038 | 0.038 | 0.038 | -0.038 |
| 15 | | | | 0.038 | -0.038 | 0.038 | 0.038 | -0.038 |

